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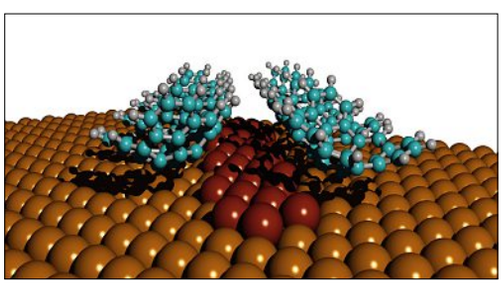
Short Abstracts of Interesting Recent Publications of Swiss Origin

Microscopic Origin of Chiral Shape Induction in Achiral Crystals

W. Xiao, K.-H. Ernst, K. Palotas, Y. Zhang, E. Bruyer, L. Peng, T. Greber, W. A. Hofer, L. T. Scott, and R. Fasel*, *Nat. Chem.* **2016**, *8*, 326. EMPA Dübendorf, University of Bern, University of Zurich

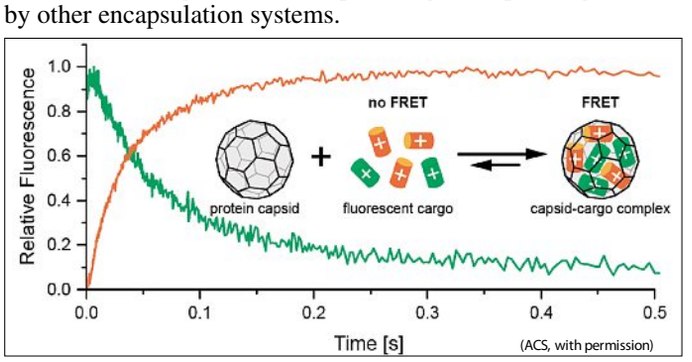
Biomacromolecules that are in contact with mineral phases can transfer their homochirality to minerals during the process of biomineralization. The way in which handedness is transmitted to achiral materials is not yet understood at the atomic level. Using scanning tunnelling microscopy, photoelectron diffraction and density functional theory, Fasel and collaborators show how a chiral 'buckybowl' imprints chirality onto a metal surface by arranging metal atoms in its vicinity. The work gives detailed insight into the interplay between molecular modifier and inorganic mineral phase and highlights the importance of chiral recognition at surfaces for induction of homochirality during biomineralization.



Diffusion-Limited Cargo Loading of an Engineered Protein Container

R. Zschoche and D. Hilvert*, *J. Am. Chem. Soc.* **2015**, *137*, 16121. ETH Zürich

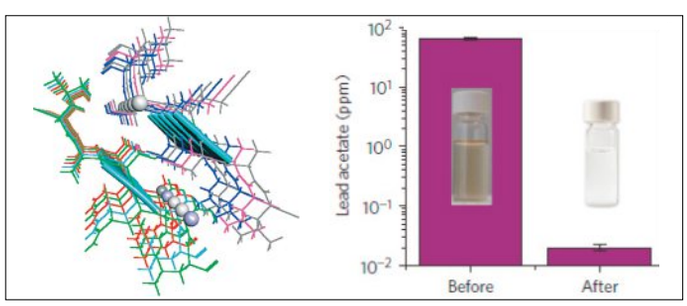
The engineered bacterial nanocompartment AaLS-13 is an artificial encapsulation system that exploits electrostatic interactions for cargo loading. Zschoche and Hilvert used a pair of fluorescent proteins to study the extent of encapsulation by Förster resonance energy transfer (FRET). The rapid encapsulation of guests is completely reversible and the equilibrium is easily tuned by varying the ionic strength. The study provides valuable information about cargo loading that will guide ongoing efforts to engineer functional host-guest complexes. Moreover, the protein FRET pair developed for this work should be adaptable for characterizing functional capsid-cargo complexes generated by other encapsulation systems.



Amyloid–Carbon Hybrid Membranes for Universal Water Purification

S. Bolisetty and R. Mezzenga*, *Nat. Nanotech. DOI:10.1038/nnano.2015.310*. ETH Zürich

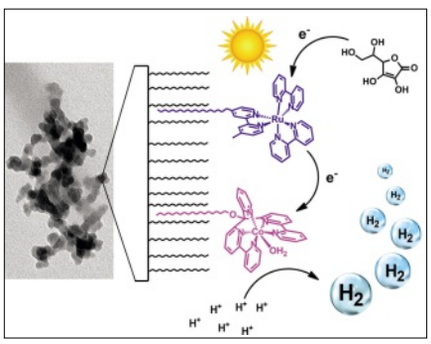
Water pollution affects millions of people worldwide and is a leading global risk factor for illness, disease and death. Current technologies for purifying metal-contaminated water are typically expensive and ion specific. Bolisetty and Mezzenga now describe the use of inexpensive hybrid membranes made from β-lactoglobulin amyloid fibrils and activated porous carbon for the removal of heavy metal ions and radioactive waste from water. The concentration of heavy metal ions drops by three to five orders of magnitude per filter passage. The membranes can even be used to recycle valuable heavy metal contaminants. Due to the affordable nature of the membrane constituents and the inexpensive processes of metal adsorption and release, these hybrid membranes may have a significant impact in addressing the global problem of waste water treatment.



Photocatalytic Proton Reduction with Ruthenium and Cobalt Complexes Immobilized on Fumed Reversed-Phase Silica

C. Bachmann, B. Probst, M. Oberholzer, T. Fox, and R. Alberto*, *Chem. Sci.* **2016**, *7*, 436. University of Zürich

Efficient water oxidizing and reducing catalysts (WOC, WRC) are required for the photocatalytic splitting of water with sunlight (artificial photosynthesis). Alberto and coworkers describe the non-covalent co-immobilization of molecular WRCs and photosensitizers on hydrophobic silica particles. The resulting support was suspended in water using anionic or cationic surfactants. Heterogeneous photocatalytic H_2 production with ascorbate as sacrificial electron donor exceeded that of homogeneous catalysis at low concentrations. The non-covalent immobilization of active catalysts on cheap supports represents a straightforward and flexible design of molecular water splitting architectures.



Prepared by Caroline D. Bösch, Markus Probst, Yuliia Vyborna, Mykhailo Vybornyi, Simon M. Langenegger and Robert Häner*

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